

## CLAIMS

1. Process for urea production of the type comprising the steps of:

5 - performing a reaction between ammonia and carbon dioxide in a reaction space to obtain a reaction mixture comprising urea, carbamate and free ammonia in aqueous solution;

10 - subjecting said mixture to a treatment of partial decomposition of the carbamate and partial separation of said free ammonia in aqueous solution to obtain a first flow comprising ammonia and carbon dioxide in vapor phase and a flow comprising urea and residual carbamate in aqueous solution;

15 - subjecting said first flow comprising ammonia and carbon dioxide in vapor phase to at least partial condensation to obtain a first portion of carbamate in aqueous solution;

- recycling said first portion of carbamate to said reaction space;

- feeding said flow comprising urea and residual carbamate in aqueous solution to a urea recovery section;

20 - separating in said recovery section said residual carbamate from the urea to obtain a second portion of carbamate in aqueous solution;

characterized in that it comprises the additional steps of:

25 - subjecting at least part of said second portion of carbamate in aqueous solution obtained in said recovery section to a treatment of partial decomposition to obtain a second flow comprising ammonia and carbon dioxide in vapor phase and a flow comprising residual carbamate in aqueous solution;

- subjecting said second flow comprising ammonia and carbon dioxide in vapor phase to at least partial condensation to obtain a third portion of carbamate in aqueous solution;

5 - recycling said third portion of carbamate to said reaction space.

2. Process according to claim 1, characterized in that the treatment of partial decomposition of the said at least part of the second portion of carbamate in aqueous solution is carried out at a pressure substantially corresponding to  
10 the pressure in the reaction space.

3. Process according to claim 1, characterized in that it further comprises the step of:

15 - feeding the flow comprising residual carbamate in aqueous solution resulting from the treatment of partial decomposition of the second portion of carbamate to said urea recovery section.

4. Process according to claim 1, characterized in that it comprises the steps of:

20 - feeding the reaction mixture comprising urea, carbamate and free ammonia in aqueous solution to a decomposition unit;

- feeding said at least part of the second portion of carbamate in aqueous solution to said decomposition unit,

25 wherein the treatment of partial decomposition of the reaction mixture and of the second portion of carbamate is carried out in the same decomposition unit to obtain said first and second flow comprising ammonia and carbon dioxide in vapor phase and a flow comprising urea and residual carbamate in aqueous solution.

5. Process according to claim 1, characterized in that at least 50% of said second portion of carbamate in aqueous solution is subjected to the treatment of partial decomposition.

5 6. Process according to claim 5, characterized in that at least 65% of said second portion of carbamate in aqueous solution is subjected to the treatment of partial decomposition.

7. Plant for urea production comprising:

10 - a urea synthesis reactor (1);

- a first stripping unit (2) for subjecting a reaction mixture leaving said reactor (1) to a treatment of partial decomposition of the carbamate and partial separation of the free ammonia in aqueous solution present in said mixture;

- means (6) for condensing at least partially the vapors leaving said first stripping unit (2) and of recycling (24) a first portion of carbamate in aqueous solution to said reactor (1);

20 - a recovery section (3, 4, 7, 8) of a flow comprising urea and residual carbamate in aqueous solution leaving said first stripping unit (2) for separating the urea produced in the reactor (1) from a second portion of carbamate in aqueous solution;

25 characterized in that it comprises:

- a second stripping unit (9) for subjecting at least part of said second portion of carbamate in aqueous solution to a treatment of partial decomposition;

- means for condensing at least partially the vapors

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leaving said second stripping unit (9) and of recycling a third portion of carbamate in aqueous solution to said reactor (1).

8. Plant according to claim 7, characterized in that said means for condensing the vapors leaving said second stripping unit (9) comprises said means (6) for condensing the vapors leaving said first stripping unit (2).

9 Plant according to claim 7, characterized in that it further comprises:

10 - means (33) for feeding a flow comprising residual carbamate in aqueous solution from said second stripping unit (9) to said recovery section (3, 4, 7, 8).

10. Plant for urea production comprising:

- a urea synthesis reactor (1);

15 - a stripping unit (2) for subjecting a reaction mixture leaving said first reactor (1) to a treatment of partial decomposition of the carbamate and partial separation of the free ammonia in aqueous solution present in said mixture;

20 - means (6) for condensing at least partially the vapors leaving said stripping unit (2) and of recycling a first portion of carbamate in aqueous solution to said first reactor (1);

25 - a recovery section (3, 4, 7, 8) of a flow comprising urea and residual carbamate in aqueous solution leaving said stripping unit (2) for separating the urea produced in the reactor (1) from a second portion of carbamate in aqueous solution;

characterized in that it comprises:

- means for feeding (26) at least part of said second portion of carbamate in aqueous solution to the stripping unit (2).

5 11. Method for modernizing a plant for urea production of the type comprising:

- a urea synthesis reactor (1);

10 - a first stripping unit (2) for subjecting a reaction mixture leaving said reactor (1) to a treatment of partial decomposition of the carbamate and partial separation of the free ammonia in aqueous solution present in said mixture;

15 - means (6) for condensing at least partially the vapors leaving said first stripping unit (2) and of recycling a first portion of carbamate in aqueous solution to said reactor (1);

20 - a recovery section (3, 4, 7, 8) of a flow comprising urea and residual carbamate in aqueous solution leaving said first stripping unit (2) for separating the urea produced in the reactor (1) from a second portion of carbamate in aqueous solution;

characterized in that it comprises the steps of:

- providing a second stripping unit (9) for subjecting at least part of said second portion of carbamate in aqueous solution to a treatment of partial decomposition;

25 - providing means for condensing at least partially the vapors leaving said second stripping unit (9) and of recycling a third portion of carbamate in aqueous solution to said reactor (1).

12. Method for modernizing a plant for urea production of

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the type comprising:

- a urea synthesis reactor (1);

- a first stripping unit (2) for subjecting a reaction mixture leaving said reactor (1) to a treatment of partial decomposition of the carbamate and partial separation of the free ammonia in aqueous solution present in said mixture;

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- means (6) for condensing at least partially the vapors leaving said first stripping unit (2) and of recycling a first portion of carbamate in aqueous solution to said reactor (1);

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- a recovery section (3, 4, 7, 8) of a flow comprising urea and residual carbamate in aqueous solution leaving said first stripping unit (2) for separating the urea produced in the reactor (1) from a second portion of carbamate in aqueous solution;

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characterized in that it comprises the steps of:

- providing a second stripping unit (9) for subjecting at least part of said second portion of carbamate in aqueous solution to a treatment of partial decomposition;


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- providing means for feeding (32) the vapors leaving said second stripping unit (9) to said means for condensing (6) the vapors leaving said first stripping unit (2).

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25 13. Method according to claim 11 or ~~12~~, characterized in that it further comprises the step of:

- providing means for feeding (33) a flow comprising residual carbamate in aqueous solution from said second stripping unit (9) to said recovery section (3, 4, 7, 8).

14. Method for modernizing a plant for urea production of



the type comprising:

- a urea synthesis reactor (1);
  - a stripping unit (2) for subjecting a reaction mixture leaving said first reactor (1) to a treatment of partial decomposition of the carbamate and partial separation of the free ammonia in aqueous solution present in said mixture;
  - means (6) for condensing at least partially the vapors leaving said stripping unit (2) and of recycling a first portion of carbamate in aqueous solution to said first reactor (1);
  - a recovery section (3, 4, 7, 8) of a flow comprising urea and residual carbamate in aqueous solution leaving said stripping unit (2) for separating the urea produced in the reactor (1) from a second portion of carbamate in aqueous solution;
- characterized in that it comprises the step of:
- providing means for feeding (26) at least part of said second portion of carbamate in aqueous solution to the stripping unit (2).

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